

# Fluid Resuscitation in Sepsis and Septic Shock: Standard Versus Individualized Management

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## Abstract

The administration of intravenous fluids is an essential component in the management of critically ill patients, especially those in septic shock, with the aim of increasing cardiac output and micro vascular perfusion. In order to optimize clinical decision making and therapeutic actions, a set of recommendations have been developed. In this sense, the guidelines Surviving Sepsis Campaign (SSC) have been the ones that have internationally guided the rapid administration of at least 30 mL/Kg of crystalloids in this scenario. The current guidelines offer little room for adaptation in the recommendations for resuscitation with fluid therapy, proposing a homogenization in the confrontation quickly, neglecting the individualization of each patient, therefore the challenge is how to promote the guidelines or protocols and at the same time encourage personalized medicine.

**Keywords:** Sepsis • Fluid therapy • Crystalloid solutions • Septic shock • Fluid resuscitation

## Introduction

Sepsis defined as a response, a deregulated immune response to infection associated with organ dysfunction, as well as the definition of septic shock, have been constantly evaluated and re-defined in order to improve the diagnostic and therapeutic process, and consolidating in this search the guidelines and treatment approach the guidelines of the new Surviving Sepsis Campaign (SSC).

In general, recommendations such as: the early identification of sepsis and septic shock together with timely and adequate management has been key to improving the morbidity and mortality results of these patients [1]. The determination of plasma lactate levels, the taking of cultures prior to the start of antibiotics, the early administration of these, the infusion of fluids in patients with hypotension or hyperlactatemia, the initiation of vasopressors in the event of hypotension that does not respond to the initial supply of Fluids have been the mainstay recommendations for managing these conditions.

In relation to the infusion of fluids, the surviving sepsis campaign 2016 (sepsis-3) guidelines recommend an initial resuscitation of at least 30 ml/kg of crystalloid in the first 3 hours, being the guideline in the management of sepsis to date [2].

Patients in septic shock require intravenous fluids in order to optimize cardiac output and micro vascular perfusion [3], however, only half of these patients achieve a favorable response to volume supply [4], with young patients being the main ones. That has a better cardiovascular response to volume expansion. In those patients who do not achieve a positive response in perfusion, we can instead generate fluid overload, a frequent phenomenon, where about two thirds of patients in septic shock show fluid overload after resuscitation, which is strongly related to organ dysfunction.

The current guidelines offer little room for adaptation in the recommendations for resuscitation with fluid therapy, proposing a rapid homogenization in the confrontation, neglecting the individualization of each patient, thus the current guidelines recommend the administration of at least 30 ml/kg as a guideline of crystalloids for hypotensive patients in the context of sepsis or with a high lactate value ( $\geq 4$  mmol/L) in the first 3 hours and even in the first hour despite the evidence that the supports is of low quality and even more, it is presented as non-existent [5-8].

Resuscitation with intravenous fluids can be beneficial when required or harmful when used in excess, associated with higher mortality [4,9]. Since 2006 with the SOAP study and later with the VASST study it has been shown that over-resuscitation with fluids has been associated with a positive fluid balance, and higher mortality in patients with sepsis and septic shock [10,11]. Current evidence suggests that the risks of excessive administration of resuscitation or maintenance fluids without a clear indication are outweighed by the benefits [12,13].

## Description

Different studies have shown that only approximately 50% of critically ill patients with inadequate cardiac output respond to this treatment [14]. It has been found that 68% of 0.9% NaCl after being administered had leaked into the extracellular space after one hour [15]. Therefore, knowing that not all septic patients present the same history, and as has been seen, not all respond in the same way to fluid therapy, it is reasonable to be criteria with the guidelines and not approach them as kitchen recipes thinking of an average responding patient.

Focused hemodynamic evaluation is needed to determine if fluid is likely to be beneficial, as is passive leg raising or end-expiratory occlusion testing [16]. When initial fluid therapy fails to achieve target blood pressure and perfusion, early initiation of vasopressors and admission to intensive care should be favored over repetitive fluid administration.

It is common to observe in the different health centers the application of the guidelines in the management of sepsis and septic shock in a uniform manner, as if they were the same patients (average or "one size fits all") [8], this given that the standardization of the guidelines and protocols in management do not give rise to its flexibility, recommending an aggressive and rapid management, also affected by the pressure of the emergency itself, which conditions rapid action without often allowing the individualization of treatment, favoring at the same time the existence of potential damages over the desired benefit.

## Conclusion

Hemodynamic resuscitation is considered the cornerstone in the initial treatment of septic shock. However, there is growing concern about its harmful effects, also given the association of excess intravenous fluids with increased morbidity and mortality.

A single management formula cannot be applied to all patients, since fluid requirements vary according to the type of patient,

especially in the recommendation to administer at least 30 ml/kg of fluids in the first 3 hours or worse in the first hour. For now, while more trial results are still awaited, a rational management of fluids in sepsis and individualizing therapy, together with a continuous hemodynamic evaluation, are recommended. It is time to improve the administration of intravenous fluids, the challenge is how to promote the guidelines or protocols and at the same time promote personalized medicine.

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## Conflict of Interest

None.

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